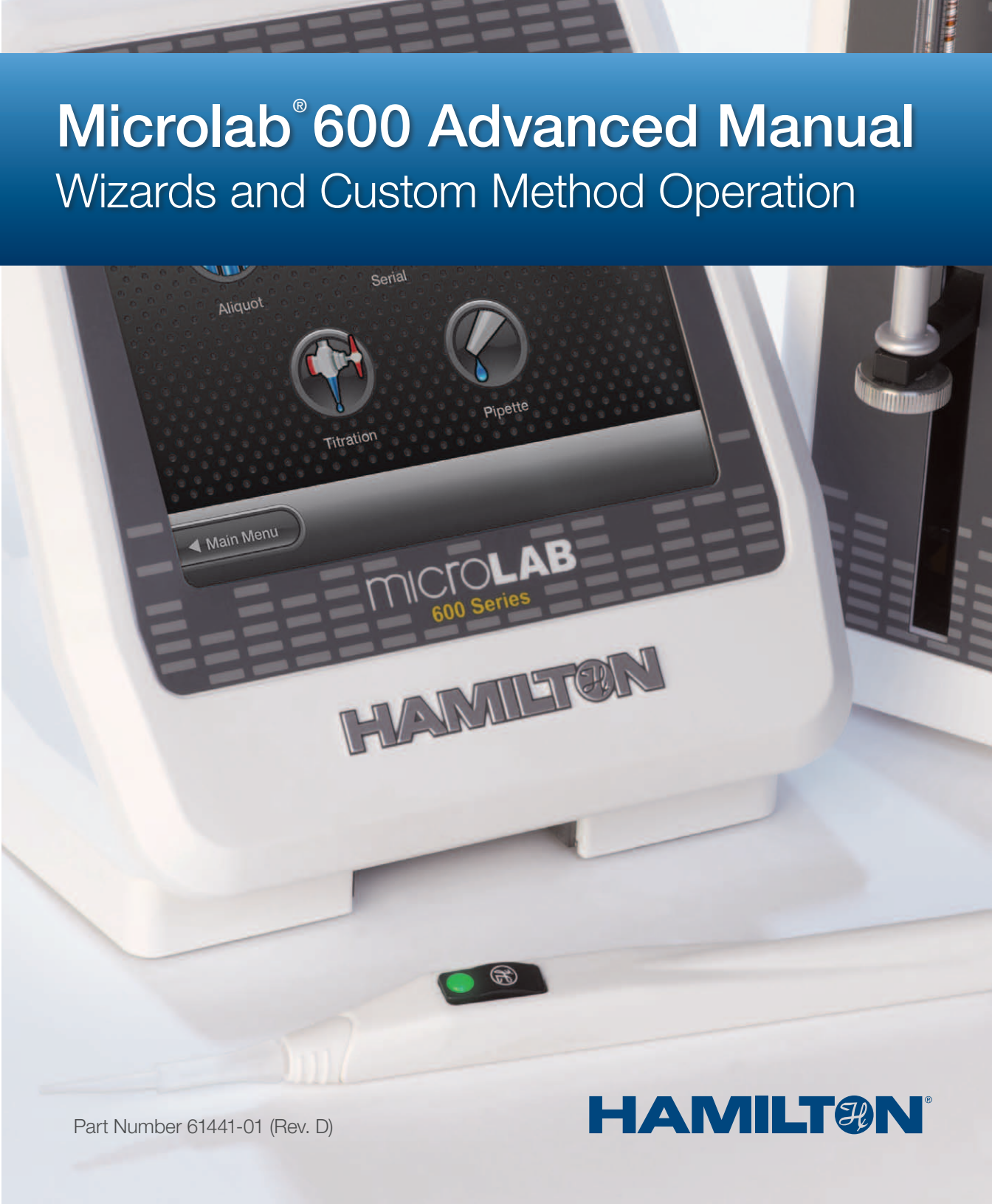
Microlab® 600 Advanced Manual

Wizards and Custom Method Operation



Part Number 61441-01 (Rev. D)

HAMILTON®

Warranty Information

Hamilton Company warrants this equipment[1] to be free of defects in material and workmanship for 12 months from the date of receipt. The warranty does not cover normal wear and tear of the syringes, valves or equipment. The warranty is extended to the buyer of record on the original purchase order to Hamilton Company. Hamilton Company or an authorized Hamilton representative agrees to repair or replace, at its option and free of charge to the buyer at a normal place of business or at a Hamilton repair facility, any part or parts that under proper and normal use prove to be defective during the warranty period.[2] Abuse, unauthorized replacement of parts, modifications or adjustments made by other than Hamilton Company or its assigned representative voids this warranty.

This warranty gives you specific rights. No other warranties, expressed or implied, including implications of warranties of merchantability and fitness for a particular product, are made. Hamilton Company's liability on the sale of all products shall be limited to repair, replacement or refund of price of any defective product.[2]

Hamilton Company endeavors to provide prompt and satisfactory service.

1—All Hamilton Company valves are warranted to be free of defects in material and workmanship at the time of delivery.

2—Hamilton Company reserves the right to refuse to accept the return of any instrument or valve that has been used with radioactive, microbiological substances or any other material that may be deemed hazardous to employees of Hamilton Company.

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Instruction to the User

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to Part 15, Federal Communication Commission (FCC) Rules. These limits are designed to provide reasonable protection against harmful interference in an installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- **Turn the Microlab® 600 Off and On to determine whether it is generating interference.**
- **Reorient or relocate the receiving antenna.**
- **Increase the separation between the equipment and receiver.**
- **Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.**
- **Consult the dealer or an experienced radio/TV technician for help.**

This equipment has been verified to comply with the limits for a class B computing device, pursuant to FCC Rules. In order to maintain compliance with the FCC regulations, shielded cables must be used with this equipment. Operation with non-approved equipment or unshielded cables is likely to result in interference to radio and TV reception. The user is cautioned that changes and modifications made to the equipment without the approval of the manufacturer could void the user's authority to operate this equipment.

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Welcome

Welcome to the World of Hamilton Precision Instruments

Congratulations on your purchase of a Hamilton Microlab 600 instrument. The Hamilton Microlab 600 is a versatile, semi-automatic, precision liquid handler. This family of instruments offers single or dual syringe units that function as dispensers, diluters and continuous dispensers.

The Microlab 600 functions on the principle of liquid/liquid displacement. At the heart of each Microlab 600 is a precise stepper drive motor combined with our uniquely designed Gastight® syringes. The result is a precise and accurate instrument that is very easy to set up and operate.

Proper handling and maintenance of your new Microlab 600 will increase the lifespan of your instrument. To learn about proper care and maintenance of your investment, please take the time to read this manual, including the warranty information.

Hamilton Company would like to thank you for your purchase of the Microlab 600.

Intended Use

The Microlab 600 family of instruments are bench top devices designed for precision liquid handling. These units are intended for indoor laboratory use by technician grade personnel. These units are also designed for industrial purposes with an emphasis on continuous dispensing in an unattended mode.

INTENDED USE

About the Microlab® 600 Manuals

Basic Microlab 600 Manual

This manual contains information on installation of the hardware, care and maintenance, and troubleshooting the Microlab 600. This manual also contains instructions needed to operate the Basic series controller.

Advanced Microlab 600 Manual

This manual contains information on operating the Advanced controller software. Users of this manual may need to refer back to the Basic Manual for hardware installation, care and maintenance, and troubleshooting the Microlab 600.

Computer Controlled Microlab 600 Manual

This manual contains information on communicating with the pump through third party software. Users of this manual may need to refer back to the Basic Manual for hardware installation, care and maintenance, and troubleshooting the Microlab 600.

Note: This manual will be on the Software CD as a help file that comes with the appropriate Microlab 600 instrument.

After reading these manuals you should be able to properly operate your Microlab 600.

Conventions Used in this Manual

Throughout this manual symbols are used to call your attention to various kinds of information.

☆ **Important!** Information that is essential for avoiding damage to equipment.

Note: Interesting information or information that can help improve system performance.

CHAPTER 1:
Introduction

The Advanced Microlab 600 Controller features a touchscreen with a custom designed user interface (UI). The UI will enable a variety of advanced applications and Custom Method programs.

1.1 Hardware Setup

1.2 Configuration

1.3 Priming the Instrument

1.4 User Interface Flow Chart

1.1 Hardware Setup

The hardware setup involves attaching the appropriate syringes and tubing for the desired application. This process is described briefly in the Quick Start Guide which is shipped with every Microlab 600. More detailed installation instructions can be found in Chapter 2 of the Microlab 600 Basic Manual (p/n 61440-01). There are four major hardware configurations that are possible for the Microlab 600. These configurations are described below.

1.1.1 Single Syringe Dispenser Setup

Single Syringe Dispenser setup is designed to dispense precise volumes of liquid from a reservoir out through a hand probe. There is a single valve that connects the syringe to tubing. When the valve rotates it connects the syringe to the input or the output tubing. The input tubing connects the syringe to a reservoir of liquid. The output tubing connects the syringe to a hand probe. At the press of a button the valve will position to the input so the syringe can fill with a user defined volume of liquid from the reservoir. A second push of a button will dispense the user defined volume from the tip of the hand probe.

A brief animation of “How a Microlab 600 Dispenser Works” can be found at www.hamiltoncompany.com/microlab600.

1.1.2 Dual Syringe Diluter Setup

The Dual Syringe Diluter setup is ideally designed to perform dilutions. The two syringes operate as one to accurately draw the sample (right syringe) and diluent (left syringe) into the system before dispensing the two liquids into a final container where they mix to complete the dilution. This application could be accomplished with a single syringe system but the dilution range would be limited to the volume range of a single syringe. With two syringes it is possible to use a 50 mL and a 10 µL syringe to draw up the sample. With this setup it is possible to perform a 50,000 fold dilution in a single step. When compared to Class A glassware, this is an incredible savings in buffers and time.

The basic dilution method involves priming the entire system with diluent. Next, the right syringe draws sample into the hand probe. The sample is completely contained in the dispense tubing and never comes into contact with the right syringe. At the same time the sample is drawn, the left syringe fills with diluent from the reservoir. Next, the two syringes dispense their entire volume out through the hand probe. The sample is dispensed from the tubing followed by the diluent which washes out the tubing and prepares the system for the next dilution.

A brief animation of “How a Microlab 600 Diluter Works” can be found at www.hamiltoncompany.com/microlab600.

1.1.3 Dual Syringe Dispenser Setup

The Dual Syringe Dispenser setup has the same capabilities as two Single Syringe Dispensers that receive commands from a single controller. Instead of one valve and one syringe like the Single Syringe Dispenser there are two pairs of syringes and valves. Each pair works independently of the other, meaning that each can be setup with a different volume syringe and can be programmed to dispense a different volume of liquid. The fluid paths are maintained completely separate so liquid in the left syringe will not mix with liquid in the right syringe until the two liquids are dispensed out the end of the hand probe. This setup is ideal for applications like epoxy dispensing where no mixing should occur until the proper quantities of each liquid have been dispensed.

A brief animation of “How a Microlab 600 Dispenser Works” can be found at www.hamiltoncompany.com/microlab600.

1.1.4 Continuous Dispenser Setup

The Continuous Dispenser setup is designed to eliminate the time wasted waiting for the syringe to refill between dispenses. This dual syringe system automatically fills one syringe while the other syringe is dispensing. Since there is always one full syringe the wait time is eliminated. This setup effectively cuts the work time of the Syringe Dispenser setup in half without sacrificing accuracy and precision by increasing the syringe speed. This setup requires that both the left and the right syringes are the same volume.

A brief animation of “How a Microlab 600 Dispenser Works” can be found at www.hamiltoncompany.com/microlab600.

1.2 Configuration

After the hardware is installed, according to Section 1.1, the controller must be told which Hardware configuration was chosen. This can be accomplished through the Configuration button accessed from the Main Menu. The configuration must match the hardware setup before the instrument can be primed and operated. For more details on configuring the Microlab 600 please reference Sections 4.2 and 4.3 in the Microlab 600 Basic Manual (p/n 61440-01).

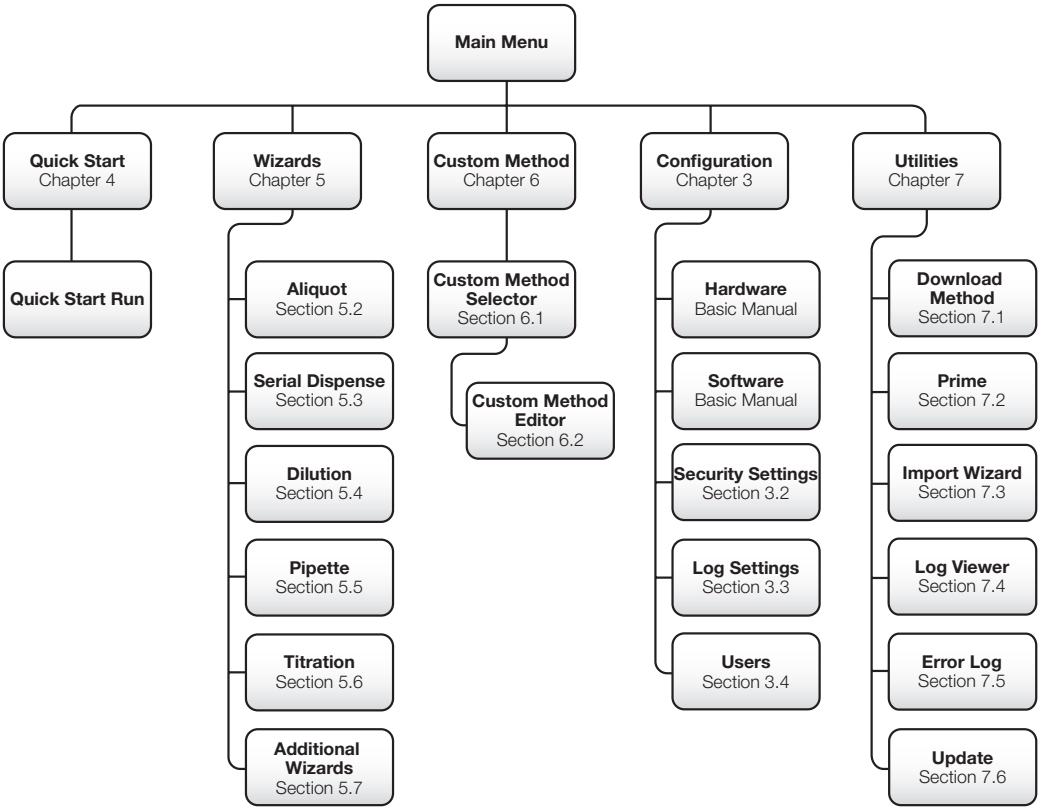
Note: Detailed Language and Security features will be described in Chapter 3.

1.3 Priming the Instrument

Priming the Microlab 600 involves filling and dispensing the syringes with liquid to push out all trapped air bubbles. Since air bubbles are compressible it is critical to remove all air prior to using the equipment. Once the instrument is assembled, priming can be started by pressing the Prime button on the front of the Microlab 600. More details on priming can be found in Section 4.4 of the Microlab 600 Basic Manual (p/n 61440-01).

1.4 User Interface Flow Chart

The flow chart below shows the relationship between the major screens in the Microlab 600 Advanced user interface. The Main Menu screen provides access to all other screens within the user interface. Press the icon buttons on the Main Menu screen to navigate through the interface. Press the Back button to return to the previous screen.



CHAPTER 2:

Overview of Screens and Buttons

This chapter will describe the features of the seven major screen types that are used throughout the user interface.

2.1 Splash Screen

2.2 Icon Screens

2.3 Run Screens

2.4 Data Entry Screens

2.5 Pop-Up Control

2.6 Numeric Keypad

2.7 Alphanumeric Keypad

2.1 Splash Screen

This is the boot up screen that will appear when the pump is powered On. The boot up will take approximately 30 seconds. Activity will be indicated by green lights that move across the bottom of the screen. After the system loads, the Main Menu screen displays. The hardware and software will need to be configured to the appropriate system configuration before proceeding to the Run screen. If the screen is not responding to touch appropriately, the screen may be calibrated. For instructions on calibrating the screen, reference Section 4.3.1.1 in the Microlab 600 Basic Manual (p/n 61440-01).

2.2 Icon Screens

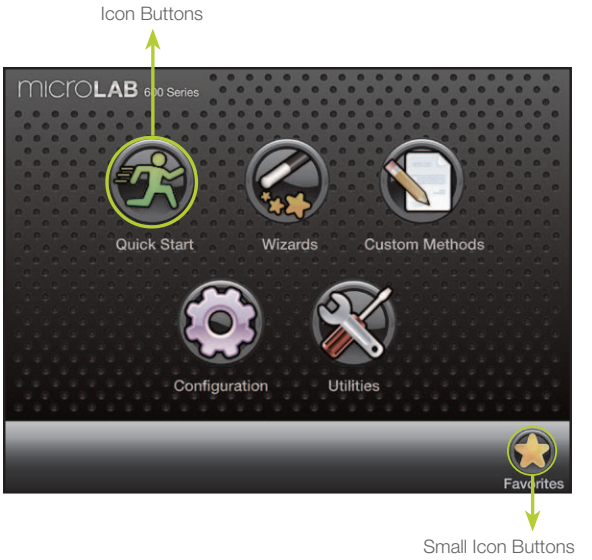
The Icon Screens are used for basic navigation through the user interface. General screens like the Main Menu will most commonly use this screen design to graphically show all possible navigation options.

Icon Buttons

These buttons are used to provide the major navigation from function to function within the user interface.

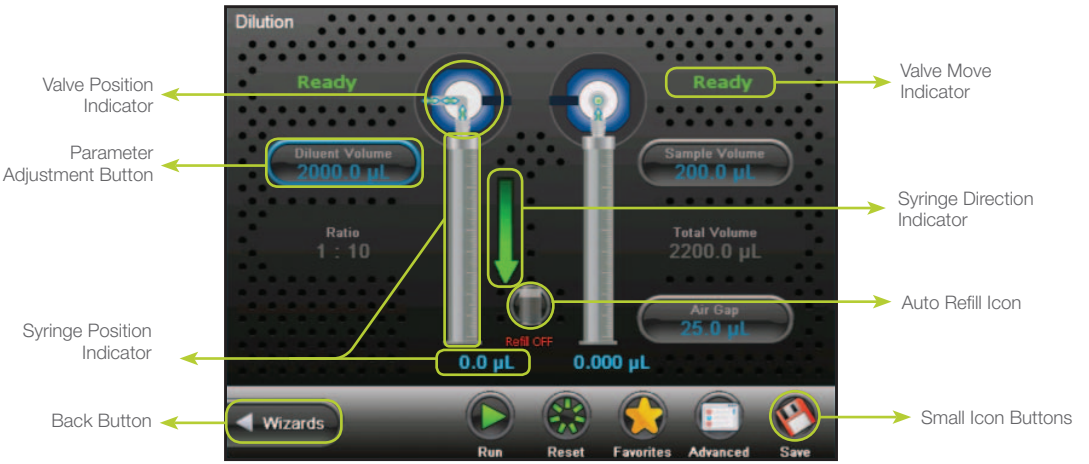
Small Icon Buttons

These provide additional functionality to change values on the current icon screen.



2.3 Run Screens

This screen enables control and monitoring of all aspects of the pump's activities. Buttons and Icons are used to change the Parameters and Indicators which are designed to give current and future status of the pump.



Valve Position Indicator

This indicator shows the current valve position and the fluid path. For more details see Section 3.3.1 in the Basic Manual (p/n 61440-01).

Parameter Adjustment Button

This button shows the current dispense setting. The exact function for these buttons will be defined in greater detail in the Quick Start, Wizards and Custom Method sections of this manual.

Syringe Position Indicator

This indicator shows the current syringe position graphically and in a numeric volume.

Back Button

This button takes the user back to the previous screen.

Small Icon Buttons

These buttons provide additional functionality to the Run screen. The exact function for these buttons will be defined in greater detail in the Quick Start, Wizards and Custom Method sections of this manual.

Auto Refill Icon

This icon can be toggled “ON” and “OFF”. When the icon is labeled “ON” the syringes automatically refill when they are empty. When the icon is labeled “OFF” the syringes will not refill until they are triggered by the hand probe or the “Run” icon.

Syringe Direction Indicator

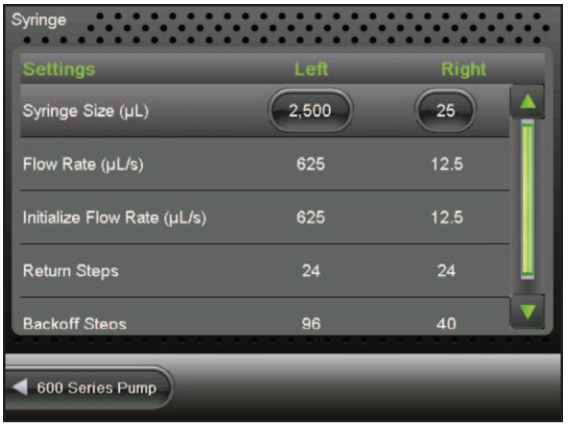
This indicator shows the direction the syringe will move in the next step. No arrow indicates the syringe will not be moving in the next step.

Valve Move Indicator

This indicator shows the current valve position and the position where the valve will move in the next step. If the indictor says “Ready”, the valve will not move in the next step. For more details on the valve positions, see Section 3.3.1 in the Microlab 600 Basic Manual (p/n 61440-01).

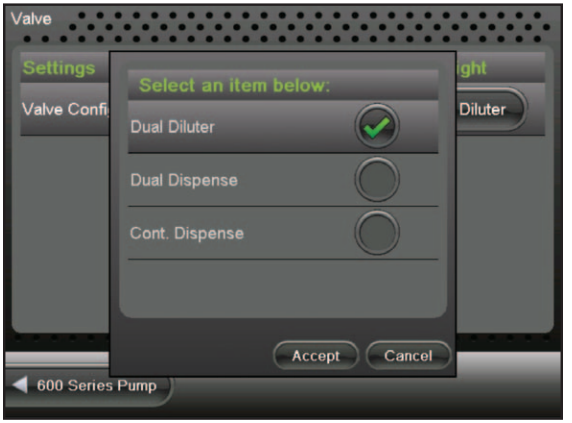
2.4 Data Entry Screens

The Data Entry Screens provide a means to input values for several grouped parameters. The values that can be changed are displayed together in a table format. Only the highlighted row from the table can be edited using the Change buttons.



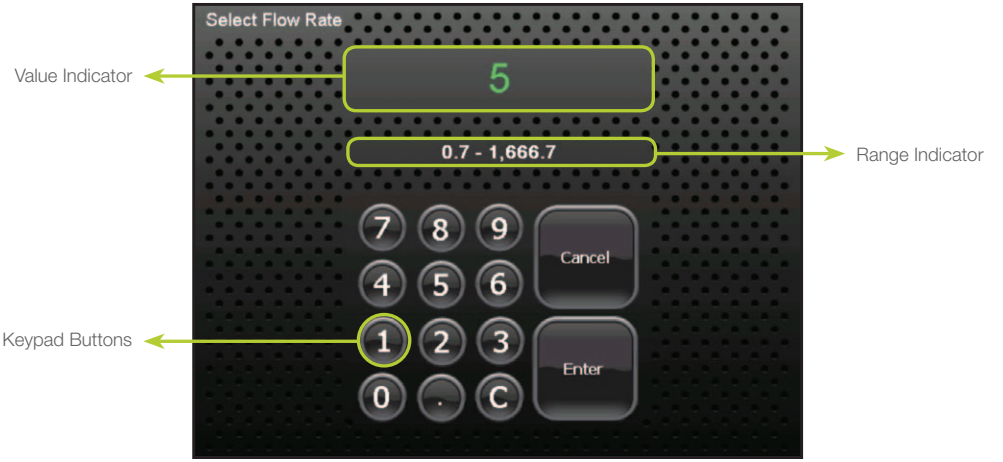
2.5 Pop-Up Control

The Pop-Up Control appears as a modal window within the current screen. All buttons outside of the modal window will be disabled until the “Accept” or “Cancel” button is pressed to close the modal. This control is used to select values from a discrete list of options.



2.6 Numeric Keypad

The screen will appear when changing a numeric value. The screen will initially display the current parameter value. There is no need to clear the current value. It will be automatically deleted once a keypad button is pressed.



Value Indicator

This indicator displays the current value that will be stored when the Enter button is pressed.

Keypad Buttons

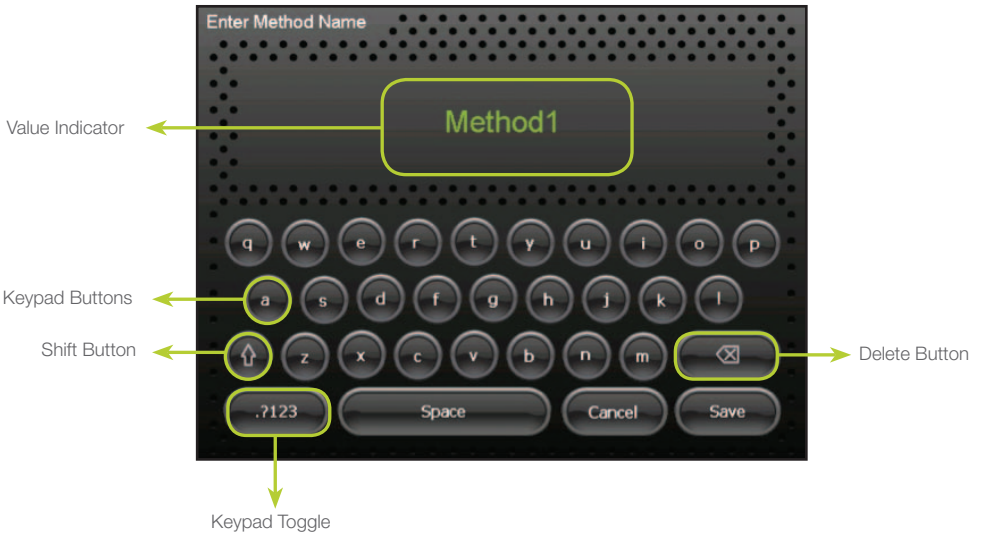
These buttons are used to add and clear numbers from the Value Indicator.

Range Indicator

For most parameters only specific values are acceptable. The Range Indicator displays the valid values for the parameter that is currently selected. If a value is entered outside of that range, the font color will turn red until an allowed value is entered.

2.7 Alphanumeric Keypad

This screen will appear when changing an alphanumeric value. The screen will initially display the current parameter value. There is no need to clear the current value. It will be automatically deleted once a keypad button is pressed.



Value Indicator

This indicator displays the current value that will be stored when the Save button is pressed.

Keypad Buttons

These buttons are used to add and clear numbers from the Value Indicator.

Shift Button

This button toggles the case of the letters from lowercase to uppercase.

Keypad Toggle

This toggles the keypad between letters and numbers.

Delete Button

This removes one character at a time from the Value Indicator.

CHAPTER 3:

Advanced Configuration Options

This chapter will describe how to configure hardware and software settings that are specific to the Advanced Microlab 600.

3.1 Configuration Wizard

3.2 Security Settings

3.3 Log Settings

3.4 Users

3.1 Configuration Wizard

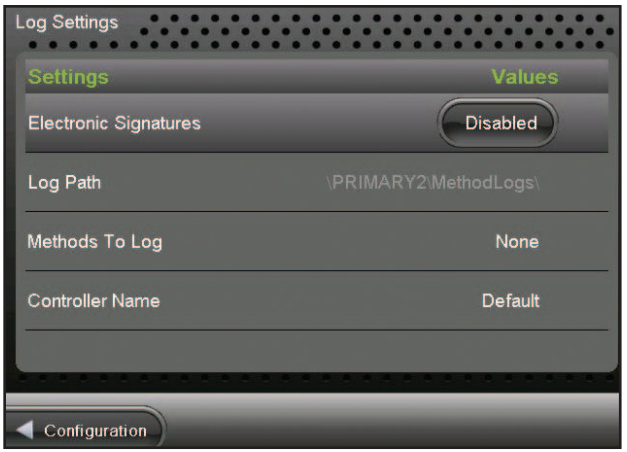
Use the Configuration Wizard to simplify the initial setup of the Microlab 600. This Wizard walks the user through the instrument hardware and software setup. It is important to make sure that the pump hardware matches the software configuration. For more details on the hardware configuration reference the Microlab 600 Basic Manual Section 4.2 (p/n 61440-01). If the choice is made to skip the Configuration Wizard, all configuration options can be accessed by pressing the Configuration button on the Main Menu.

3.2 Security Settings

For labs requiring traceability the Microlab 600 provides the option to force users to login before they can create, edit or run methods. To enable the use of passwords and user accounts, select Security Settings. This screen manages the use of User Accounts, the expiration of the User Keys and the maximum number of times an incorrect User Key can be entered before the user account is locked. The first time that User Accounts are enabled the system will automatically create an Administrator Account (User ID = admin and User Key = 7913). After User Accounts are enabled, the system will force the user to login as the Administrator before any other settings can be adjusted.

3.3 Log Settings

The Microlab 600 controller provides the ability to save a log of pump activities to the SD card. Logging can be enabled per each Wizard so some Wizards can be logged while other Wizards are not. For regulated customers requiring 21 CFR Part 11 compliance, Electronic Signatures can be enabled if the Security Settings are also enabled. Once Electronic Signatures are enabled, all Wizards and Custom Methods must be logged. If multiple systems are used by the same laboratory, a unique controller name can be entered to simplify the management of log files. Log files created on the Microlab 600 can be viewed and printed directly from the controller by purchasing the Printer Upgrade Kit (p/n 61500-04). For more details on the printer option refer to Section 7.4.



The Microlab 600 SD card can store hundreds of log files depending on the number of activities recorded in each log. For archiving purposes Hamilton has provided a PC application on the Advanced CD called LyncStore®. This application allows for management and archiving of files transferred from the SD card to a PC. From this PC application, you can filter, archive, view and print log files. Learn more about LyncStore at www.hamiltoncompany.com.

3.4 Users

The Users screen provides the ability to edit existing users, add users and export and import users. To enter this screen, User Accounts must be enabled under Security settings and a user with access to modify accounts must be logged into the system.

3.4.1 Edit User

This screen is used to modify the settings of an existing user account. A user account consists of a User ID, First Name, Last Name, enabled or disabled flag, user key and user roles. The user roles define what controller settings a specific user is able to change. Only one account can be set to have Administrator access. The other accounts can be set to enable or disable the ability to create and edit user accounts, edit the pump configuration, modify Favorites and methods and run Wizards and methods only. In addition to editing account information, the Edit User screen allows for the deletion of user or for the user key to be reset in the event it is forgotten.

3.4.2 Add User

The Administrator or a user who has the ability to create and edit user accounts may add new users to the pump. To add a new user, simply fill in the User ID, First Name, Last Name and set the user role. Once all the settings are input the Users button on the bottom left of the screen will be enabled. Press this button to exit the screen and save the new account. When you exit the screen the system will automatically generate a User Key for the new account. Record the User ID and the User Key for future use. The first time the operator logs into this account they will be given the opportunity to change the User Key.

3.4.3 Exporting and Importing Users

To export users, press the Export Users button and the data will be saved to the SD card. To import user accounts, insert the SD card with the exported user files into a new controller and press the Import Users button and the users will be uploaded to the pump.

CHAPTER 4: Quick Start

When the Quick Start button is selected from the Main Menu the user will be taken directly to the Basic Run screen. From this screen the user can enter a dispense volume for the left and right syringe using the Parameter Adjustment button. The syringes will fill and dispense the selected volume when the hand probe is triggered.

For more detailed instructions on the Quick Start option, please refer to Chapter 4 of the Microlab 600 Basic Manual (p/n 61440-01).

CHAPTER 5: Wizard Screens

This section discusses the Advanced Wizards for the Microlab 600. It is possible that new Wizards have been created that are not described in this document. To request a Wizard or to review new Wizards, visit www.hamiltoncompany.com/microlab600/wizards.

5.1 Wizard Basics

5.2 Aliquot Wizard

5.3 Serial Dispense Wizard

5.4 Dilution Wizard

5.5 Pipette Wizard

5.6 Titration Wizard

5.7 New Wizards

☆ **Important!** Before operating these Wizards make sure your pump is configured correctly and is well primed.

5.1 Wizard Basics

To simplify the programming of the Microlab 600, Wizards were created for common dispensing and diluting applications. These Wizards are designed to enable the user to quickly change from one dispense volume or dilution to the next with minimal time and hassle. This section of the manual will describe the features that are common to most Wizards.

- 5.1.1 Run/Pause
- 5.1.2 Favorites
- 5.1.3 Advanced Settings
- 5.1.4 Save
- 5.1.5 Auto-Refill

5.1.1 Run/Pause

Run/Pause is a small icon button present on every Run screen. This button serves a similar purpose to the trigger button on a hand probe. When the Run button is pressed the pump will begin to perform the programmed action. The Run button will convert to a Pause button until the action is completed and then will turn back into a Run button. If the Pause button is pressed in the middle of an action, the pump will stop after the current action is completed. To stop the pump immediately, press the Back button on the bottom left of the screen.

Note: The Pause feature is only available in the Custom Method Run screen.

5.1.2 Favorites

Operations that are performed frequently can be stored as Favorites and then recalled for use at a later time. Press the Favorites button to store the current Wizard setup as a Favorite or to change the current Wizard setup to a previously stored Favorite setting. When selecting a previously stored Favorite, the menu will display only the Favorites that were stored with the same valve and syringe setup that is currently configured.

5.1.3 Advanced Settings

For most Wizards the default settings for the Microlab 600 will provide the best results. For applications that require greater control over the pump settings the Advanced menu provides an interface to adjust the following settings:

Speed for Syringe Fill, Dispense, Aspirate, Wash Fill, Wash, Initial and Step Dispense
This option will be automatically set to the syringe speed defined by the Syringe Setup in the Hardware Configuration Menu. The user may change the speed to any desired speed. The UI will suggest three dispense speeds for the current syringe size but a custom option is always available. Syringe speed is defined in µL/sec. Speeds faster than the default may result in a syringe stall.

Red/Green Probe Light
This option will allow the user to control when the indicator light on some hand probes will be On and Off. Valid selections for Wizards are to turn the light to Busy, Trigger or Never. Both lights cannot be the same setting.

Aliquots to Dispense (Aliquot Wizard Only)
This is the number of aliquots to dispense before refilling the syringe. This will be automatically set to the maximum number of aliquots that will fit within the configured syringe. For a Dual Syringe Dispenser the default will be the maximum number of aliquots that can be achieved by both syringes.

Program Mode (Dilution Wizard Only)
There are four parameters that can be used to program a dilution. These parameters are sample volume, diluent volume, factor and total volume. Entering any two of these parameters is enough to calculate the remaining two parameters so the Dilution Wizard only allows for the adjustment of two at the same time. The default active parameters are Diluent Volume and Sample Volume. This advanced setting allows for the selection between:

- **a.** Adjust Diluent Volume and Sample Volume
- **b.** Adjust Diluent Volume and Factor
- **c.** Adjust Diluent Volume and Total Volume
- **d.** Adjust Sample Volume and Factor
- **e.** Adjust Sample Volume and Total Volume
- **f.** Adjust Factor and Total Volume

Factor Type (Dilution Wizard Only)
This allows the user to toggle between a dilution factor or a ratio when preparing dilutions.

Air Gap Mode (Dilution and Pipette Wizards Only)
Some pipette applications require the sample and the system fluid to be separated in the tubing by an air gap. This minimizes the mixing in the tubing and reduces the possibility for carryover. The default for this mode is Off. There are two On modes: Automatic and Trigger.

Automatic means that prior to aspirating a sample the pump will automatically pull in an air gap when the previous sample has been dispensed. To provide sufficient time to remove the tip from the recently dispensed sample an Air Gap Delay can be set between the dispense and the air gap aspiration.

Trigger means that the pump will wait for the user to press the trigger button when the air gap should be aspirated.

Post Sample Air Gap Mode (Dilution and Pipette Wizards Only)
Some dilutions call for small sample volumes (100 µL and less). The act of inserting the probe into the sample and removing it can result in excess sample stuck to the outside of the tip. For these small sample volumes this excess could be enough to impact results. To achieve the highest accuracy and precision possible it may be necessary to wipe excess sample from the outside of the tip. To eliminate wicking the sample out of the tubing during wiping, the user may add a Post Sample Air Gap to create an air pocket between the sample and the end of the tubing. The volume of the Post Sample Air Gap may be set by pressing the Post Sample Air Gap button and inputting a volume in microliters (µL).

Air Gap Delay and Post Air Gap Delay (Dilution and Pipette Wizards Only)
When the Air Gap Mode or Post Sample Air Gap Mode is set to Auto it is possible to specify a delay between the completion of the previous step and the triggering of the air gap. This delay specifies the number of seconds the pump will wait before triggering the air gap.

Wash Mode (Dilution and Pipette Wizards Only)
The Wash Mode provides the option to push a wash volume through the system to clean out the tubing. When Wash Mode is turned On the wash will occur after a dilution or pipette operation has completed and before the next dilution or pipette operation is started. The default for this mode will be Off. If turned On a new Parameter Adjustment button will appear on the run screen. This button will provide the means to enter the desired wash volume.

Syringe Selection (Dilution and Pipette Wizard with Dual Syringe Dispenser Configuration Only)
The Pipette Wizard only requires a single syringe. For the Single Syringe Dispenser, Dual Syringe Diluter and Continuous Dispenser Configurations, the left syringe is automatically chosen. For the Dual Syringe Dispenser, it is possible to use the left or right syringe. The user must decide which syringe to use when entering the Wizard. This setting allows the user to select the left or right syringe.

Step Auto-Repeat Delay (Titration Wizard Only)
The process of titration requires the repetitive dispensing of small volumes. As the user approaches the endpoint of a titration there is a need to dispense the Step Volume one at a time, with each press of the trigger. When the user is further away from the endpoint, holding the trigger for a time dictated by the Step Auto-Repeat Delay will result in repetitive dispensing of the Step Volume until the button is released.

Number of Steps (Titration Wizard Only)
This number is set based on the volume of the syringe used for the titration. If the syringe used is a 2.5 mL and the Step Volume is 250 µL, then the number of Steps is 10.

5.1.4 Save

The Save button is used to store the current Wizard settings as a Favorite or as a Custom Method. Saving the settings as a Favorite allows the settings to be quickly recalled through the current Wizard. Saving a Wizard as a Custom Method provides the opportunity to customize a method beyond the capabilities of the Wizard. It also provides a distinct file that can be transferred between pumps or transferred to a PC and shared with colleagues. Once a file is saved as a Custom Method it can no longer be opened using the Wizard.

5.1.5 Auto-Refill

The Auto-Refill button can be toggled ON and OFF at any time. When the Auto-Refill button is turned ON the syringes will automatically fill from the reservoir. When Auto-Refill is turned OFF the pump will wait to fill the syringes until the user triggers the fill with the hand probe.

5.2 Aliquot Wizard

This Wizard is used to repetitively dispense aliquots of the same size at the press of a button. The liquid is drawn in from the reservoir and then multiple dispenses are performed until the syringe is empty. The dispense volume is controlled by the Parameter Adjustment button. In the screen on the next page the left syringe is set to dispense 250 µL and the right syringe is set to dispense 3 mL. The dispense volume can be changed at any time and the system will recalculate the number of dispenses possible and the proper time to refill. The Ready to Dispense indicator shows how many aliquots have been completed out of the total number of aliquots possible. Use Aliquots to dispense in the Advanced settings to set the number of aliquots to a lesser value.

5.2.1 Single Syringe Dispenser with Aliquot Wizard

The single dispenser will only show one syringe on the screen and one Parameter Adjustment button for that syringe.

5.2.2 Dual Syringe Diluter with Aliquot Wizard

The diluter only has the ability to fill the left syringe from a reservoir. This means that there will only be one Parameter Adjustment button.

5.2.3 Dual Syringe Dispenser with Aliquot Wizard

This is the setup pictured in Section 5.2.2. Both syringes will fill and dispense at the same time. The number of dispenses that can be achieved between refills is dictated by the maximum number of dispenses that are in common between the left and right syringe. For example, if the left syringe size is 1,000 µL and the right syringe size is 100 µL, while the dispense volumes are 250 µL and 10 µL respectively, the maximum number of dispenses would be four. This is because the left syringe can dispense 250 µL four times and the right syringe can dispense 10 µL ten times.

5.2.4 Continuous Dispenser with Aliquot Wizard

To run this Wizard with a Continuous Dispenser setup, both the left and the right syringes must be the same volume. The Continuous Dispenser fills one syringe while the other syringe is dispensing. This technique minimizes the amount of time between dispenses by eliminating the refill step.

5.3 Serial Dispense Wizard

This Wizard is used to repetitively dispense aliquots of differing sizes at the press of a button. The liquid is drawn in from the reservoir and then multiple dispenses are performed until the syringe is empty. The current dispense volume is controlled by the Parameter Adjustment button. The current dispense volume can be changed at any time and the system will recalculate the number of dispenses possible and the proper time to refill. The Ready to Dispense button shows how many dispenses have been completed out of the total number of dispenses that are programmed in the Editor. Press the Ready to Dispense button to jump to any valid dispense number.

Editor: The entire list of programmed dispenses can be edited by pressing the Editor small icon button. This will bring up the Serial Dispense Editor where values can be added, deleted and modified.

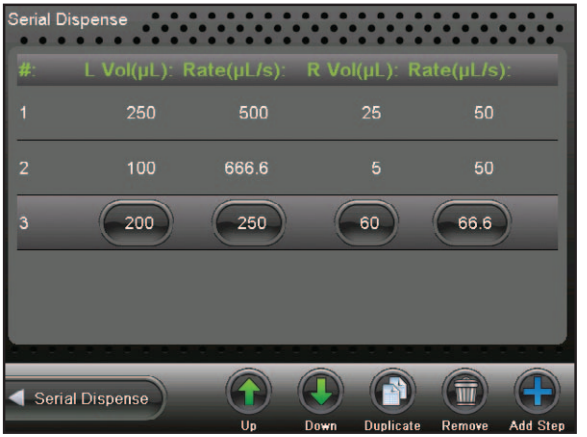
Hold On/Off: The Serial Wizard dispenses volumes from the Editor one at a time in order from the first dispense to the last. When the last dispense number is reached it starts over with dispense number 1. Turning the Hold On will cause the current dispense number to be dispensed until the hold is turned Off at which time the Serial Wizard will move to the next dispense.

5.3.1 Single Syringe Dispenser with Serial Dispense Wizard

The Single Syringe Dispenser will only show one syringe on the screen and one Parameter Adjustment button for that syringe.

5.3.2 Dual Syringe Diluter with Serial Dispense Wizard

The diluter only has the ability to fill the left syringe from a reservoir. This means that there will only be one Parameter Adjustment button next to the left syringe for the Serial Wizard.



5.3.3 Dual Syringe Dispenser with Serial Dispense Wizard

This is the setup pictured above. Both syringes will fill and dispense at the same time.

5.3.4 Continuous Dispenser with Serial Dispense Wizard

To run this Wizard with a Continuous Dispenser setup both the left and the right syringes must be the same size. The Continuous Dispenser fills one syringe while the other syringe is dispensing. This technique minimizes the amount of time between dispenses by eliminating the refill step.

5.4 Dilution Wizard

This Wizard is used to dilute sample with diluent. The diluent is drawn in from the reservoir into the left syringe. The sample is aspirated into the hand probe by the left or right syringe depending on the programmed volume. Next, the sample and the diluent are dispensed out the hand probe into the destination vessel where the solutions are mixed together. Since the sample was drawn into the hand probe last, it is dispensed first. The sample is then trailed by the diluent which washes out the hand probe tubing minimizing carryover for the next sample.

Note: To reduce carryover between samples, use an air gap to minimize mixing in the tubing. Additionally ensure that the volume of the air gap and the sample does not exceed 80% of the volume in the dispense tubing so the sample does not get pulled into the syringes. Custom length tubing is available to increase the volume of the dispense tubing.

A brief animation of “How a Microlab 600 Diluter Works” can be found at www.hamiltoncompany.com/microlab600.

A dilution can be programmed using any two of the following parameters: sample volume, diluent volume, factor and total volume as discussed in Section 5.1.3. These parameters are controlled by the Parameter Adjustment buttons. The current dilution can only be changed prior to aspirating sample.

Reset: Since the allowable sample volume and diluent volume are dependent on each other it may be necessary to reset all values to achieve the desired dilution. Pressing the Reset button will set all volumes to zero.

5.4.1 Single Syringe Dispenser with Dilution Wizard

The Single Syringe Dispenser will only show one syringe on the screen. The diluent will be drawn into the syringe from the reservoir first. When the hand probe is inserted into the sample a simple trigger will aspirate the sample. Another trigger will dispense the sample from the tubing, followed by the diluent.

5.4.2 Dual Syringe Diluter with Dilution Wizard

The Dilution Wizard was designed to enable large dilutions in a single step. Using a 50 mL syringe on the left it can fill with large volumes of diluent while a syringe as small as 10 µL on the right can accurately aspirate extremely small volumes of sample. Large dilutions in a single step will result in a savings of time and materials.

5.4.3 Dual Syringe Dispenser with Dilution Wizard

The syringes for this hardware setup behave independently. This means that only one syringe can be used with the Dilution Wizard. The syringe that is active can be selected in the Advanced menu. The selected syringe will behave the same as the single syringe system described in Section 5.4.1.

5.4.4 Continuous Dispenser with Dilution Wizard

The Continuous Dispenser setup is not supported by the Dilution Wizard. The instrument can be reconfigured to a Dual Syringe Diluter setup in the software to run this Wizard without changing the hardware.

5.4.5 Disposable Tip Hand Probe with Dilution Wizard

The Disposable Tip Hand Probe (DTHP) is used when there are concerns of cross-contamination. The DTHP is designed to allow the user to aspirate samples into a tip that can be disposed, thus eliminating any potential cross-contamination. The tips that are used with this probe are the ClickSure® tips, for ordering information reference Appendix B in the Microlab 600 Basic User Manual (p/n 61440-01). When the DTHP is attached to the Microlab 600 instrument, the instrument will recognize that the probe is attached to the pump. This probe can then be configured to right or left-handedness by pressing Configuration from the Main Menu and then editing the setting within the hardware menu. Once the probe is configured the user may use the DTHP as described below.

When the DTHP is plugged into the Microlab 600 the Dilution Wizard will automatically pause between dispensing the sample and the diluent to allow for the tip to be ejected. The sample is aspirated into the ClickSure tip by the right syringe while the diluent is filled into the left syringe. Then the probe is triggered to dispense the sample. After the sample is dispensed the instrument will pause for tip ejection. Then the diluent will be dispensed through the probe to complete the dilution.

Note: The sample is being aspirated by air displacement. The syringe will move the requested volume but the amount of liquid drawn into the tip depends on many factors like surface tension, viscosity, atmospheric pressure, humidity, density, etc. To achieve the highest possible accuracy it is recommended to check pipetted volume using a balance. If the accuracy is low or high adjust the requested sample volume to compensate for this expected variance.

5.5 Titration Wizard

This Wizard is used to slowly add liquid to another liquid until an endpoint is reached. An example of this application is an adding acid or base to change the pH of a buffer. This Wizard fills with liquid from a reservoir and then performs an initial dispense. This dispense is often larger than the step dispense and is designed to get the user close to the endpoint without going over. Next, the step volume is added one at a time until the endpoint is reached. The Wizard will continually dispense the step volume and will refill the syringes if necessary. The total volume dispensed is tracked by the Total Volume Indicator.

Restart: Once the endpoint is reached the instrument can be reset for the next titration by pressing the Restart button to start the Wizard over.

5.5.1 Single Syringe Dispenser with Titration Wizard

The Single Syringe Dispenser will only show one syringe on the screen and two Parameter Adjustment buttons and one indicator for that syringe.

5.5.2 Dual Syringe Diluter with Titration Wizard

The diluter only has the ability to fill the left syringe from a reservoir. This means that this setup will behave the same as the single syringe system described in Section 5.5.1.

5.5.3 Dual Syringe Dispenser with Titration Wizard

This is the setup pictured in Section 5.5.2. Both syringes will fill and dispense at the same time. If it is desired to turn one syringe Off it is possible to set the dispense volumes to zero.

5.5.4 Continuous Dispenser with Titration Wizard

The Continuous Dispenser setup will behave like a single syringe system except that one syringe will be filling while the other syringe is dispensing to minimize the time wasted during filling.

5.6 Pipette Wizard

This Wizard is used to transfer liquid from one vessel to the next. First the system must be primed with a system fluid. This is usually a liquid that is compatible with the liquid to be transferred like water or buffer. Next the liquid is aspirated into the hand probe by the left or right syringe depending on the instrument setup. The liquid is then dispensed from the hand probe into the destination vessel. If desired, an additional wash can be preformed between samples to ensure the fluid path is clean.

Note: To reduce carryover between samples use an air gap to minimize mixing in the tubing. Additionally ensure that the volume of the air gap and the sample does not exceed 80% of the volume in the dispense tubing so the sample does not get pulled into the syringes. Custom length tubing is available to increase the volume of the dispense tubing.

5.6.1 Single Syringe Dispenser with Pipette Wizard

The Single Syringe Dispenser will only show one syringe on the screen. When the hand probe is inserted into the sample a simple trigger will aspirate the sample. Another trigger will dispense the sample into the destination vessel.

5.6.2 Dual Syringe Diluter with Pipette Wizard

The Dual Syringe Diluter system can aspirate and dispense volume from the left or right syringe. This is set in the Advanced menu. If a wash is required, this must be programmed using the left syringe since the right syringe does not have the ability to draw liquid in from the reservoir.

5.6.3 Dual Syringe Dispenser with Pipette Wizard

This hardware setup is pictured above. The syringes for this hardware setup behave independently meaning that only one syringe can be used with the Pipette Wizard. The syringe that is active can be selected in the Advanced menu. The selected syringe will behave the same as the single syringe system described in Section 5.6.1.

5.6.4 Continuous Dispenser with Pipette Wizard

The Continuous Dispenser setup is not supported by the Pipette Wizard. The instrument can be reconfigured to a Dual Syringe Diluter setup in the software to run this Wizard without changing the hardware.

5.7 New Wizards

The Microlab 600 instrument comes with a set of standard Wizards which include Aliquot, Serial Dispense, Dilution, Titration and Pipette. As new Wizards are developed they will be posted to our website at www.hamiltoncompany.com/microlab600/wizards. At this link you can browse the latest wizards and install them directly into your controller.

Installing a New Wizard

Download the desired Wizard from the website onto the root of the SD card (do not unzip the file). Insert the SD card into the controller, press the Configuration icon and then the Software icon. From there select the item called Manage Plugins. At the bottom of the screen there is an Install button. Press this to see a list of installation files that are on the SD card. Choose the desired Wizard from the list and the installation process will begin. Once complete the new Wizard icon will be visible on the Wizard screen. The Manage Plugins screen may also be used to delete installed plugins by selecting the plugin to be deleted and pressing the delete icon at the bottom of the screen.

CHAPTER 6:

Custom Methods

This chapter will enable users to create, run and edit Custom Methods. This chapter includes a discussion of the following topics:

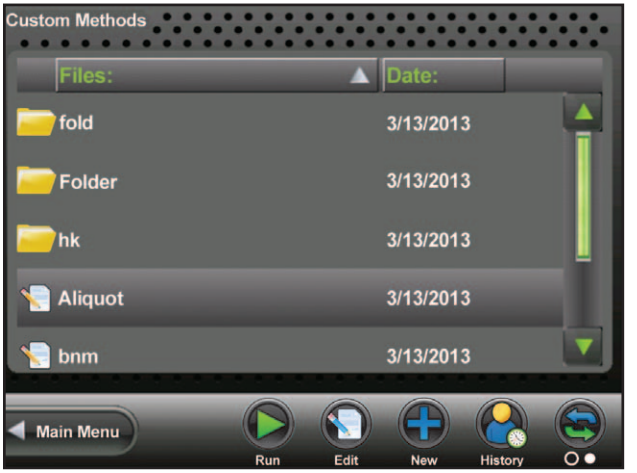
6.1 Creating or Selecting a Custom Method

6.2 Editing a Custom Method

6.3 Running a Custom Method

6.1 Creating or Selecting a Custom Method

From the Main Menu screen, press the Custom Methods button. This will open the method selector screen. This screen displays all of the Custom Methods and Folders that are stored on the SD card. To select a method simply highlight or toggle to the method or folder to open. Then the user has the option to Run or Edit the method. If the user choses to create a new method or folder then they may press the New button and select the option that is applicable.



Icon	Function
	Up Level—Use the Up Level button to close the current folder and move one level up in the folder hierarchy. This will only be visible when a folder is highlighted.
	Down Level—Use the Down Level button to open the current folder and move one level down in the folder hierarchy. This will only be visible when a folder is highlighted.
	Run—Press this button to trigger the steps in the Custom Method.
	Edit—Press this button to edit an existing Custom Method.
	New—Press this button to create a new Custom Method or Folder.
	History—Press this button to see when a Custom Method was last modified.
	Toggle—Press this button to toggle between the small icon buttons above and the buttons below.
	Cut/Paste—This allows the user to Cut a Custom Method and Paste it into a folder or move to another location. Highlight the Custom Method that needs to be moved, press Cut, this button will then turn to Paste. Press the Paste button when you have selected the desired location for the method.
	Rename—Press this button to rename a Custom Method or Folder.
	Duplicate—Press this button to duplicate a Custom Method.
	Delete—Press this button to delete a Custom Method.

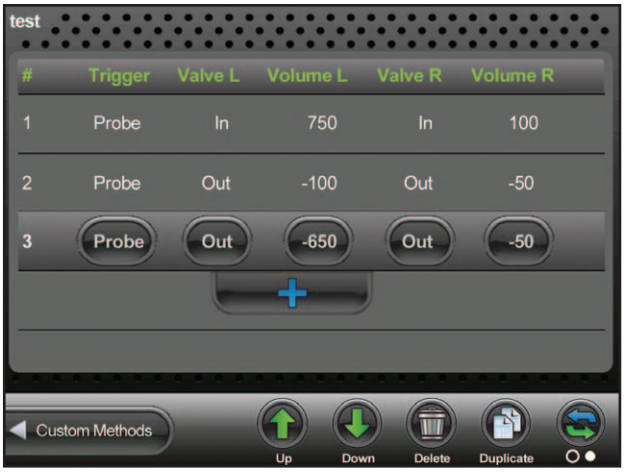
6.2 Editing a Custom Method

This section describes how to edit a Custom Method. First navigate to an existing method or create a new method as described in Section 6.1. With the method highlighted press the Edit button to proceed to the Custom Method editor. The method editor will display all of the steps that have been added to the method. Each row in the table represents a unique step in the method. The details of these steps dictate how the syringes, valves, probe lights, TTL ports, etc. will behave in that particular step. The combination of multiple steps makes up a method. A single step can tell the syringe to fill or dispense. An aliquot method would consist of a fill step followed by multiple dispense steps. When pressing the Back button the user will have the option to save changes to the method. The different ways to modify step details and combined steps into a method are described in the following sections.

- 6.2.1 Modifying Basic Step Details
- 6.2.2 Modifying Advanced Step/Method Details
- 6.2.3 Looping Steps
- 6.2.4 Validate Method

6.2.1 Modifying Basic Step Details

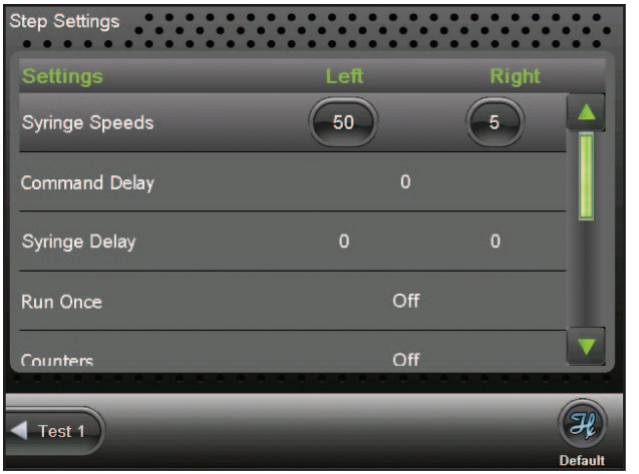
The Basic Step details are the most commonly modified step values and can be controlled by highlighting the step and using the change buttons in the line. Each change button in the highlighted row controls the value for a particular step. Pressing the change button that corresponds to the valve position will toggle between In and Out with the valid valve positions for the current valve setup. Pressing the change button for volume brings up a numeric keypad for entry of volume in microliters (µL). A positive volume indicates the syringe will fill by the programmed amount while a negative volume indicates the syringe will empty by the programmed volume. To add additional steps in the method simply press the blue plus button after the last line in the method as indicated on the following page.



As shown above the third row is highlighted. When the row is highlighted it can be moved up or down using the Up or Down icons. If this row needs to be deleted, then the Delete button may be pressed to remove the row. Finally, if this row should be duplicated the user may press the Duplicate button.

6.2.2 Modifying Advanced Step/Method Details

The Advanced Step or Method details can be accessed by clicking the small icon buttons at the bottom of the edit screen. The Advanced Step settings are specific to the Step that is highlighted at the time the advanced button is pressed. The Advanced Method settings are global to all steps. All of the advanced options will default to the most reasonable setting for the current syringes and valves selected. For most methods is will not be necessary to adjust these options. Discussed on the following pages is a listing of all the available options and their function. The Default small icon button can be used to reset all the advanced settings back to their default.



Syringe Speeds

This will be set to the speed saved in the instrument configuration. If the speed is to be changed, only valid speed values will be allowed. Three suggested speed options will be proposed along with the option to choose a custom speed. If the liquid is viscous or a custom speed is chosen that is faster than the default, there is a risk of the syringe stalling. All speeds are measured in µL/sec.

Command Delay

This is the delay between the completion of one step and the start of the next step. Optional values are between 1 and 3,600 seconds. The default will be to have no delay so the commands execute as quickly as possible.

Syringe Delay

For some applications it is required to start moving one syringe while the other syringe is still moving. Since the pump ignores all new commands until the previous command is completed it is necessary to use the Syringe Delay for this purpose. Optional values are between 1 and 3,600 seconds. The default will be to have no delay so that both syringes start moving at the same time.

Run Once

This may be toggled to either On or Off. A setting On means that the step will only be executed the first time through the method. The next time through the method this step will be skipped. Steps with an On setting cannot follow an Off setting, which means that the On steps must be grouped together at the beginning of a method. The default for this setting will be Off.

Counters

The Counter will increment for the selected step each time it is executed in the method. There are six unique counters so it is possible to keep track of up to six different metrics. The valid options are 1 through 6 but the default for the Counter is Off.

Trigger Side

This will allow the user to select which side of the instrument the pump may be triggered from in a given step. The options are Either, Left or Right. The pump default setting will be Either.

Valve Rotation

This allows the user to set the rotation to Shortest, clockwise (CW) or counterclockwise (CCW). The default setting will be Shortest.

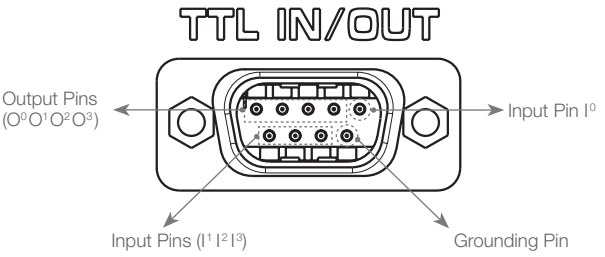
Probe Light Trigger/Busy

This option will allow the user to control the indicator light on the hand probe. The valid selections will be to turn the light to Green, Red or Off. The light will turn on as soon as the step is sent to the pump and will remain on until the next step is sent to the pump. The default value for this setting will be Off so if it is desired to have the light on for multiple steps it must be turned on in each step.

TTL

This option will allow the user to turn On and Off a 5 volt signal to each of the four TTL output pins on the back of the Microlab 600. The pins can be turned On and Off in any configuration using a series of four binary digits ($O^3O^2O^1O^0$) to represent the On/Off state of each pin. A value of 0 indicates that the pin will be turned Off while a value of 1 indicates the pin is On. To turn pin 0 On while pins 1, 2 and 3 are Off the proper number would be 0001. To turn pins 1 and 2 On while pins 0 and 3 are Off the proper number would be 0110. The pin numbers are described in Figure 6.1.

Figure 6.1 TTL IN/OUT Pin Diagram



The remaining two advanced features are global settings that affect the entire Custom Method.

Method Repeat

This tells the controller how many times to run a method. The setting will default to zero indicating that the method will repeat infinitely. Once the last step is performed it will start back at the beginning with the first step. This means the syringes must begin and end empty so that over time they will not overfill or over dispense. If the desired method calls for the last step to leave some liquid remaining in the syringe it will be necessary to limit the number of times the method can be executed to avoid an error.

Method Trigger Default

This allows users to choose a default value for the trigger column in the Basic Step details. This makes it so it is not necessary to change the trigger value every time a new line is created. The default for this setting will be Probe but there are three trigger options available:

- **Auto: When Auto is selected the pump will immediately send the command to the pump once the previous command has completed.**
- **Probe: When Probe is selected the pump will wait for a trigger from the hand probe before sending the command for the current step to the pump.**
- **TTL: When TTL is selected the instrument will wait for a change in the value detected by the four input pins located on the back of the pump. This can be used to trigger the pump in an automated process. See Figure 6.1 to identify which TTL pins are used for input signals.**

6.2.3 Looping Steps

On occasion it is necessary to repeat the same step or a series of steps more than once. An example of this would be an aliquot dispense where the same dispense is performed 25 times. It would be possible to duplicate the same dispense step 25 times but it could be cumbersome to modify a method written in this way. The Loop button allows the user to loop a single step or a series of steps multiple times. To insert a loop highlight the step before you want the loop to start. Press the Loop icon to insert the beginning and end of the loop below this step. Then highlight the End Loop row and press the down arrow to move the end of the loop below the step(s) that will be looped. Finally highlight the Begin Loop row and enter the number of times you would like this loop to repeat. A loop can be deleted by highlighting either Begin Loop or End Loop and pressing the delete button.

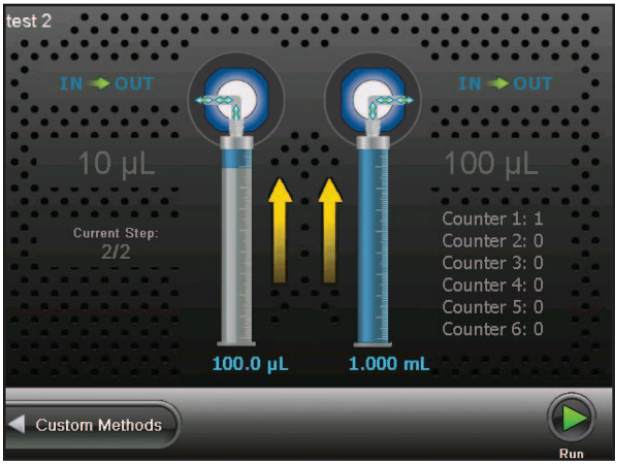
6.2.4 Validate Method

When a method is written it is possible to accidently program the syringes to overfill or over dispense. The validate button tests the entire method and looks for runtime errors. Successfully passing validation will minimize the possibility of errors when running a new Custom Method.

6.3 Running a Custom Method

This section describes how to run a Custom Method. First navigate to an existing method as described in Section 6.1. With a method highlighted, press the Run button to proceed to the Custom Method Run screen. It will only be possible to run methods that were created with the same hardware and software that is currently configured on the instrument.

The Custom Method Run screen will look and function similar to the Wizard Run screens. The major difference is that there are no Parameter Adjustment buttons. Only the indicators are available to show the current and future status of the pump.



CHAPTER 7:
Utilities

This chapter focuses on the Utilities of the instrument. In this chapter the following topics will be discussed:

7.1 Download a Method

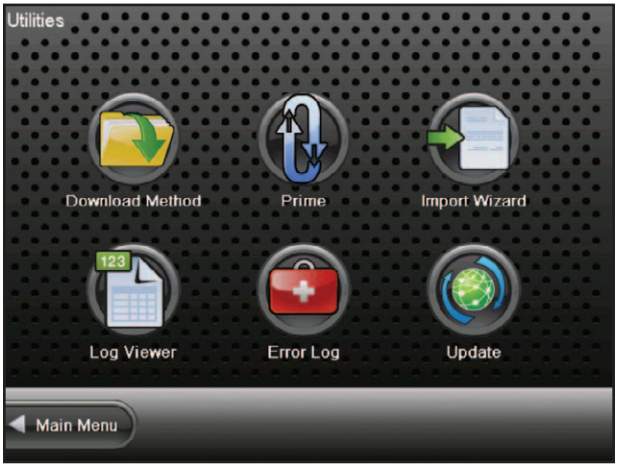
7.2 Prime Pump

7.3 Import Wizard

7.4 Log Viewer

7.5 Error Log

7.6 Update



7.1 Download a Method

This function is used to download a Custom Method from the controller to the drive unit. This can be used to run a method from the pump while the controller is disconnected. The drive unit will only be able to execute the method when the controller is disconnected.

7.1.1 Downloading the Method

Press the Download Method button and navigate through the Method selector to find the method to be downloaded. Press the Download small icon button to send the selected method to the pump. This will overwrite the existing method stored on the pump. Next, toggle the Execute button to On. This means that the next time the pump is turned on it will be ready to execute from the pump memory.

☆ **Important!** It is important to toggle the Execute button Off when using the controller to run the pump. If Execute is not turned Off, there is a period of about 30 seconds after powering the pump before the controller connects. If the hand probe is pressed during this time, it will begin to run the method stored in memory. After the controller connects, the method in memory will be temporarily disabled until the next power cycle.

7.1.2 Running a Method from the Pump

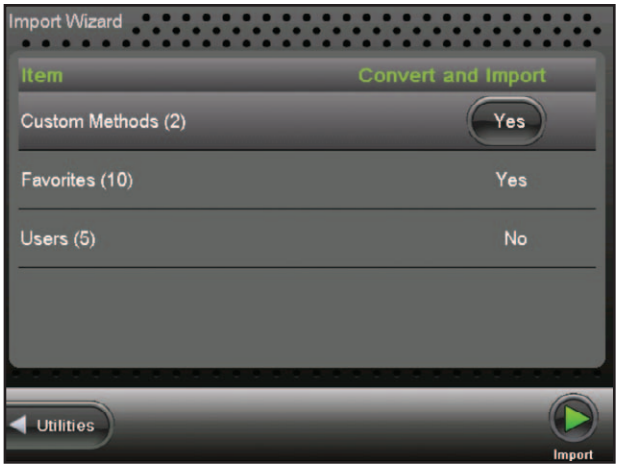
After downloading a method to the pump, cycle the power Off and remove the controller. Power the pump On and then press and hold the hand probe trigger for three seconds. This will cause the pump to initialize. Press the trigger again to start method execution.

7.2 Prime Pump

The easiest way to prime the Microlab 600 is by pressing the Prime button on the front of the instrument. If a defined number of priming cycles or a custom flow rate is desired, the Prime pump button provides an interface to achieve a custom prime.

7.3 Import Wizard

The Import Wizard is used when transferring files from controller part number 61500-01 to controller part number 61500-05. To use this function, take the SD card with saved files out of controller part number 61500-01 and place into the new controller part number 61500-05. Then press the Utilities button and select the Import Wizard button the screen below should appear.



Toggle the Convert and Import buttons to Yes for the files you wish to convert. Then press the Import Run button to convert the selected files. Converting the files allows the user to use the files from controller 61500-01 on 61500-05. The conversion process creates new files and does not delete the originals from the SD card. The methods, Favorites and users are functional on the old and new controller.

Note: If you only have controller part number 61500-05 you will not need to use this function.

7.4 Log Viewer

This section focuses on viewing method logs, installing the printer and printing method logs.

7.4.1 View Log

A user may view a log by selecting the Utilities button from the main screen and then selecting the Log Viewer button. The files in the Log Selector will be titled using the Wizard or Custom Method name, followed by the date and time. To select a file, scroll to the desired file and select the View button. In the Log Selector the Administrator can print or view the log. Within the Log Viewer the Administrator can sign or print the log or view log or step details. Printing the log files will be discussed in more detail in Section 7.4.3. By signing the log, the Administrator can either approve or reject the log file. The Log Details button will show the electronic signature information, whether the log was approved or rejected, user data, device configuration, hardware details, controller data and method edit history. The Step Details will show the details of a specific step in a method.

7.4.2 Installing the Printer

The Printer Upgrade Kit that is compatible with the Microlab 600 is part number 61500-04. The Printer Upgrade Kit contains an HP printer and an additional accessories box. The components required for connecting the printer to the Microlab 600 are as follows: the black and color inkjet cartridges, power supply and power cord. All other components in the HP printer box are not required to connect to the Microlab 600. In the accessory box there will be a USB cable, USB adapter, country-specific power cord (if country other than North America or Japan) and a Printer Quick Start Guide (p/n 64965-01). Instructions for installing the printer to the Microlab 600 are listed on the next page.

Note: The USB adapter is only used with Microlab 600 controllers with the part number 61500-01.

Step 1. Make sure the Microlab 600 instrument is turned off.

Step 2. Place the USB cable into the Host USB port on the back of the controller.

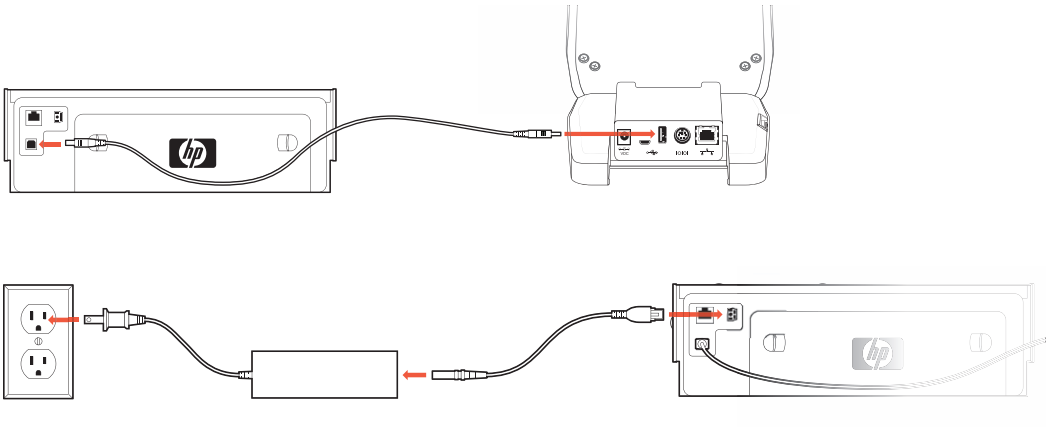
Step 3. Connect the other end of the USB cable into the printer USB port.

Step 4. Attach the power supply to the printer.

Step 5. Attach the power cord to the power supply and plug into a wall outlet.

Step 6. Turn the Microlab 600 On and then turn the printer On.

Note: When connecting the printer to a controller with the part number 61500-01, use the USB adapter between the printer USB cable and the controller.



7.4.3 Printing the Log

To print the desired log, navigate to the Log Selector by selecting the Utilities button and then the Log Viewer. Highlight the log to be printed by using the scroll bars and press the Print button. If you do not have the Printer kit, it is possible to print the log files from a PC. Simply download Hamilton's LyncStore software from www.hamiltoncompany.com/microlab600. Import the log files from the SD card to the PC using LyncStore and then print from any printer connected to the PC.

7.5 Error Log

The Error Log provides a listing of the most recent errors recorded by the controller. The Error Log may be exported and sent to Hamilton Company to review and aid in troubleshooting. Additional Hamilton technical support is available at:

In the United States and Canada:

Hamilton Company Inc.
4970 Energy Way
Reno, Nevada 89502
USA

Customer Service
(888) 525-2123

Technical Support/Service
(800) 648-5950

Outside the U.S.
+1 (775) 858-3000

In Switzerland:

Hamilton Bonaduz AG
Via Crusch 8
Ch-7402 Bonaduz
Switzerland

Customer Service
+41 81-660-60-60
Fax +41 81-660-60-70

7.6 Update

The most current version of the Microlab 600 Firmware/Software will be posted at www.hamiltoncompany.com/microlab600. Select the latest version of software to update an older Microlab 600 with current Firmware/Software. Download the .ZIP update file and transfer it to an SD card. Transfer the entire file; do not extract the files, this process will be handled by the Microlab 600 controller. Insert the SD card into the controller and then turn the instrument on. Once the controller is booted up, navigate to the Utilities screen and press the Update button. Then press Start to begin the update. Follow the instructions on the screen to complete the update.

CHAPTER 8:

Icon Index

This chapter will define the function and purpose of the major icons used throughout the user interface.

Main Menu Icons

Icon	Function
	Quick Start—This option provides the same functionality as a Basic Microlab 600. See Chapter 4 of the Microlab 600 Basic Manual (p/n 61440-01) for details.
	Wizards—Press to select from a list of available Wizards.
	Custom Methods—These methods are created by the user to fill a need outside the capabilities of the Wizards. These methods enable the user to control all major functions of the pump.
	Configuration—Press this button to set the Hardware and Software settings.
	Utilities—Press to download a method, prime the pump, import Wizards, view logs, export the error log and update the instrument.

Wizard Menu Icons

	Aliquot—Press to enter the Run screen for the Aliquot Wizard.
	Serial Dispense—Press to enter the Run screen for the Serial Dispense Wizard.
	Dilution—Press to enter the Run screen for the Dilution Wizard.
	Titration—Press to enter the Run screen for the Titration Wizard.
	Pipette—Press to enter the Run screen for the Pipette Wizard.

Main Menu Icons

Icon	Function
	Hardware—Press to set the Syringe, Valve and Trigger settings for the instrument.
	Software—Press to set the Controller, Versions and 600 series pump settings.
	Security Settings—Press to select Security Settings such as whether User Accounts are Required, Max Login Retries, Key Life Span and the Key Expiration Warning.
	Log Settings—Press to set Electronic Signatures, Log Path, Methods to Log and the Controller Name.
	Users—Press to select Edit, Add, Export or Import users.
	Edit—Press to edit an existing user.
	Add User—Press to add a new user.
	Export Users—Press to export users from the Microlab 600.
	Import Users—Press to import users from a different Microlab 600.

Utilities Menu Icons

Icon	Function
	Download Method—Press to download a Custom Method from the controller to the drive unit. See Chapter 7.1 for details.
	Prime—Press to set the number of prime cycles as well as the flow rate of the prime.
	Import Wizard—Press this button to convert and import methods from the 61500-01 controller.
	Log Viewer—Press to view and print logged methods.
	Error Log—Press to download the Error Log from the pump onto the SD card.
	Update—Press this button to update the current Microlab 600 software to the version that is present on the SD card.

Main Menu Small Icon Buttons

	Log On—Press to log in to the instrument using an Adminstrator or User Account.
	Log Off—Press to log off of the instrument.
	Favorites—Press to recall methods that are frequently used and saved as a Favorite.

Wizard Small Icon Buttons

Icon	Function
	Run—This button is present on every Run screen and functions like the hand probe to trigger the instrument.
	Favorites—Applications that are frequently used may be saved as a Favorite and recalled for use at a later time.
	History—Press this button to see the history of when the Favorites were last modified.
	Delete—Press this button to delete a Favorite.
	Advanced—Press this button to see the advanced detail of the current Wizard. See Chapter 5 for more details.
	Save—This button is used to store the current Wizard setting as a Favorite or as a Custom Method.
	Refill—This can be turned OFF and ON at anytime. When the Refill is set to ON; the syringes will automatically fill. When this is set to OFF, the pump will wait for a trigger before refilling.
	Hold—Press the Hold button in the Serial Dispense Wizard to repeat the current dispense. After the Hold button is turned Off the Serial Dispense Wizard will continue to the next dispense.
	Editor—Press this button to edit the list of dispense volumes programmed for the Serial Dispense Wizard.
	Up—Press this button to move a line up in the Serial Dispense Wizard Editor.
	Down—Press this button to move a line down in the Serial Dispense Wizard Editor.

Icon	Function
	Duplicate—Press this button to duplicate a line in the Serial Dispense Wizard Editor.
	Remove—Press this button to delete a line in the Serial Dispense Wizard Editor.
	Add Step—Press this button to add a line in the Serial Dispense Wizard Editor.
	Reset—Press to set all volumes in the Dilution Wizard to zero. Since the valid values for some dilutions settings are related, a reset may be required to program the desired dilution.
	Restart—Press this button in the Titration Wizard once the endpoint is reached to start the next titration. The volume counter will reset to zero and the Wizard will start again with the initial dispense.
	Default—Press this button to change the settings in the Advanced screen back to the defaults.
Custom Method Small Icon Buttons	
	Run—This button is present on every Run screen and functions like the hand probe to trigger the instrument.
	Pause—When a method is running the user may press this icon to pause the application. The pump will stop after the current step is completed. To resume movement the user may press the Run button. To stop syringe movements immediately, press the Back button to exit the Run screen.
	Edit—Press this button to edit an existing Custom Method.
	New—Press this button to create a new Custom Method or New Folder.
	History—Press this button to see when a Custom Method was last modified.

Icon	Function
	Down Level—Press this button to open the current folder and move one level down in the folder hierarchy.
	Up Level—Press this button to close the current folder and move one level up in the folder hierarchy.
	Toggle—Press this button to toggle to more options in the Custom Method screens.
	Cut—This will cut a method from the Custom Methods screen and will allow the user to move the method into a new folder.
	Paste—After a method is cut the user may use this function to paste the method into a new folder in the Custom Methods screen.
	Rename—Press this button to rename a method or folder.
	Duplicate—Press this button to duplicate a method in the Custom Methods screen or to duplicate a step in a method.
	Delete—Press this button to delete a method from the Custom Methods screen or to delete a step in a method.
	Validate (not validated)—Press this button to validate that the Custom Method that is currently being edited can run without overfilling or over dispensing.
	Validate (validated)—When this icon is displayed the Custom Method that is currently being edited passed validation.
	Step—Press this button to adjust advanced settings that pertain only to the step that is highlighted in the step editor.
	Method—Press this button to adjust advanced settings that pertain to the entire Custom Method.

Icon	Function
	Loop—Press to loop a single step or a series of steps multiple times. See Chapter 6 for more details.
	Up—Press this button to move a line up in a Custom Method.
	Down—Press this button to move a line down in a Custom Method.
	Default—Press this button to change the settings on the Advanced screen back to the defaults.

Configuration Small Icon Buttons

Icon	Function
	Change Key—Press this button to reset a user key.
	Delete—Press this button to delete a user.
	Edit—Press this button to edit a user information.
	History—Press this button to see when the User List was last modified.

Utilities Small Icon Buttons

Icon	Function
	Download, Update, Start—Press this button to download a Custom Method to the pump, import files from the 61500-01 controller, transfer the Error Log to the SD card and/or Update your pump.
	Disable Method Execution—After downloading a method to the pump the user has the option to turn the method execution on or off. When method execution is disabled any methods stored on the pump will become inactive.
	Enable Method Execution—When the method execution is enabled the pump will run the method stored in memory when the trigger is pressed on the probe and held for three seconds. See Chapter 7 for more details.
	Print—Press this button to print a log file.
	View—Press this button to view a log file.

CHAPTER 9:

Microlab 600 Drivers for Windows®

The Microlab 600 was designed to communicate with a standard PC using the Ethernet port. To simplify programming Hamilton Company has provided a Windows® based Application Programming Interface (API) in the form of several .DLL files that were included on the CD shipped with the Advanced system. The .DLL files can be referenced by most programming environments that are compatible with Microsoft® .NET 2.0 framework. Common programming languages include Visual Basic®, Visual C#® and LabVIEW™.

☆ **Important!** Before connecting the Microlab 600 to a PC it is important to turn Off the Power Over Ethernet (POE). Before turning the POE Off or On the Microlab 600 must first be turned Off. Next toggle the POE setting by pressing and holding the power button for three seconds during power up. The green Ready light will flicker when POE has been turned On or will illuminate solid when POE is turned Off. The POE state will be stored in memory so the setting will remain when the instrument is turned Off and back On.

9.1 Setting the PC to Communicate with a Static IP Address

9.2 Application Programming Interface (API)

9.3 Programmer's Help File

9.4 LabVIEW™ Example Program

9.5 Visual C#® Example Program

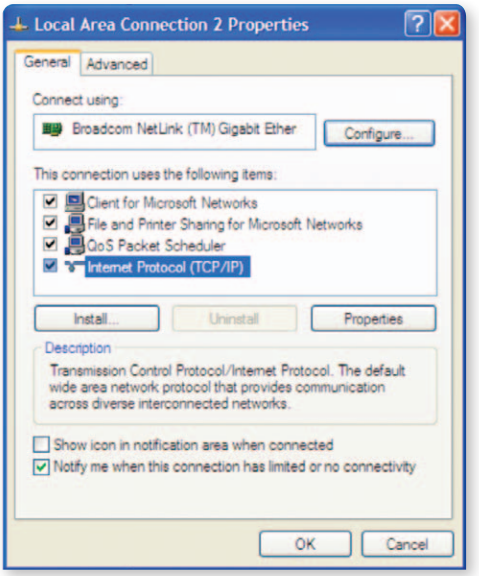
9.6 Visual Basic® Example Program

9.1 Setting the PC to Communicate with a Static IP Address

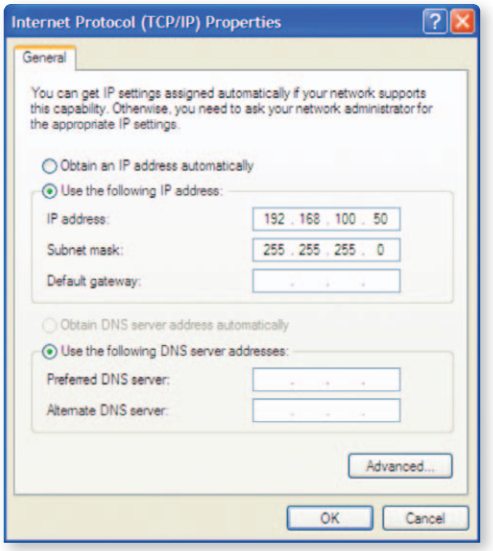
Generally when a PC is connected to a network it is setup in Dynamic Host Configuration Protocol (DHCP). When connecting directly to the Microlab 600 it is mandatory to set the PC to communicate using a Static IP address. In Windows® this can be quickly done using the following steps:

Step 1. Enter the Control Panel and select Network and Sharing Center.

Step 2. Click on the Local Area Connection and select Properties to get the following dialog box.



Step 3. Highlight the Internet Protocol (TCP/IP) item and select the Properties button to bring up the following dialog box.


Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
192 . 168 . 100 . 50
Subnet mask:
255 . 255 . 255 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

Step 4. Select “Use the following IP address” and enter 192.168.100.50 for the IP address and 255.255.255.0 for the Subnet mask. Press the OK button and close all open dialog boxes so the settings take effect.

Note: The default IP Address for the Microlab 600 is 192.168.100.100. If the decision is made to change the settings and subsequently the new settings are lost it is possible to revert the pump back to the factory settings. Start with the pump turned Off. Next press and hold the Prime button and power the instrument On, continue to hold the Prime button for three seconds. The power LED light will flash five times to indicate the pump is reset to the factory default settings.

9.2 Application Programming Interface (API)

On the CD that was provided with the Microlab 600 there is a folder named ML600 API. In this folder there are several .DLL files that can be referenced in the desired programming environment. Referencing .DLL files can vary depending on the programming environment. Refer to your development environment’s documentation to properly reference the .DLL.

9.3 Programmer's Help File

On the CD that was provided with the Microlab 600 there is a file named ML600API.CHM. This is a complied help file that can be opened by Windows® and provides detailed instructions on the functions included in the API. Contained in the file are instructions describing the purpose of a function, proper values to pass to the function and expected return values from the function.

9.4 LabVIEW™ Example Program

On the CD that was provided with the Microlab 600 there is a folder named \Examples\ML600_LabView_Examples. This folder contains the .VI files used by an example program to connect to the pump, initialize, change parameters and move the syringes and valves. To view and edit the .VI files you will need a computer with LabVIEW™ installed and complete the steps below. It is possible to run the LabVIEW™ program without LabVIEW™ installed by running the .MSI file located at \Examples\ML600_LabVIEW_Examples\Installer.

Step 1. Copy the .VI files to a folder on the PC.

Step 2. Copy the .DLL files in the ML600 API folder to the same folder as the .VI files on the PC.

Step 3. Open LabVIEW™ and reference the .DLL files.

Step 4. Open the Connect.vi file and double click on the constructor node to reference the location of the MicrolabDaisyChain.DLL file.

Step 5. Switch your computer to communicate with a static IP address as described previously in Section 9.1.

Step 6. Connect the Microlab 600 to the Ethernet port on the PC and power it On.

Step 7. Open LabVIEW™ and then open LabVIEW™ Example.VI. This is the main .VI which uses the subVIs to send commands to the pump.

9.5 Visual C#® Example Program

On the CD that was provided with the Microlab 600 there is a Visual Studio® solution in the folder \Examples\C# named ML600_C#_Example. This is source code for a simple application that serves as an example of how to connect to the pump, initialize, change parameters and move the syringes and valves using Visual C#®. The program can be viewed and compiled by downloading the free trial of Microsoft® Visual Studio®.

9.6 Visual Basic® Example Program

On the CD that was provided with the Microlab 600 there is a Visual Studio® solution in the folder \Examples\VB named ML600_VB_Example. This is source code for a simple application that serves as an example of how to connect to the pump, initialize, change parameters and move the syringes and valves using Visual Basic®. The program can be viewed and compiled by downloading the free trial of Microsoft® Visual Studio®. A compiled version of the program can be executed by running the .EXE file in the same folder.

Glossary

Advanced
This is the button that allows users to go to the advanced options for the Wizards they are running. See Chapter 5 for more details.

Air gap
A segment of air that is aspirated through the probe, used to separate different liquids in the tubing lines.

Air gap delay (Dilution and Pipette Wizards only)
When the Air Gap Mode is set to automatic the user will have the ability to determine the amount of time in seconds, to delay between dispensing the previous sample and aspirating the air gap.

Air gap mode (Dilution and Pipette Wizards only)
Some dilution and pipette applications require the sample and the system fluid to be separated in the tubing by an air gap. This minimizes the mixing in the tubing and reduces the possibility for carryover. The default mode is set to Off.

Air gap volume
This is the volume of air that is to be aspirated to separate two independent solutions in the dispense tubing.

Aliquot
A method in which fluid is distributed in equal increments multiple times.

Aliquots to dispense (Aliquot Wizard only)
This is the number of aliquots to dispense before refilling the syringe. This will automatically be set to the maximum number of aliquots for the syringe volume.

Aspirate
To pick up a designated volume of sample or air from the valve output port into a probe or tubing.

Auto refill icon
This icon can be toggled ON or OFF. When the icon is labeled ON the syringes will automatically refill when they are empty. When the icon is labeled OFF the syringes will not refill until they are triggered by the hand probe or the Run button.

Back button
This button will take the user back to the previous screen.

Change buttons
Each button corresponds to a column from the highlighted row on the screen. Click the button associated with the value to be adjusted to complete the change.

Command delay
This is the delay between the completion of one step and the start of the next step. Optional values are between 1 and 3,600 seconds. The default will be to have no delay so the commands execute as quickly as possible.

Configuration screen
This is the screen on the controller where the user can select the Hardware and Software parameters for the unit. See Sections 4.2 and 4.3 in the Basic Manual (p/n 61440-01).

Counters
The step counter will increment for the step each time it is executed in the method.

Default
A factory setting, for example, each syringe size has a default syringe speed.

Delete
If a method needs to be deleted the user may scroll through the list of methods and highlight the method to be deleted and press the Delete button.

Delete button
This removes one character at a time from the Value Indicator.

Diluent
A liquid that is added to a sample to lessen the sample's concentration.

Dilute
To reduce the concentration of solutes in a sample by adding another fluid. The fluid that is added is called diluent and may be deionized water, for example.

Diluter
An instrument used to reduce the concentration of a liquid. The ML615-DIL and ML625-DIL are Dual Syringe Diluters.

Dispense
To distribute fluid from a syringe in a single portion or in several increments out through the valve output port and attached tubing. A diluent is dispensed during a dilution. Reagents and buffers can be mixed and dispensed together with a sample before analysis.

Download
To transfer information from one instrument to another. For example, you can download a method from a controller unit to an attached drive unit. See Chapter 7 for more details.

Dual dispenser
A two syringe instrument that can dispense two different liquids at the same time. The volumes of the liquids do not have to be equal. The ML615-DIS and ML625-DIS are Dual Syringe Dispensers.

Factor type (Dilution Wizard only)
This allows the user to toggle between dilution factor or a ratio when preparing dilutions.

Hardware key
This is a Hamilton specific SD card that unlocks advanced capabilities.

Hold On/Off (Serial Dispense Wizard only)
This will allow the user to dispense the same volume over and over until the Hold button is released. When the Hold button is On it will lock the dispense number until the Hold button is pressed again. When this is turned Off the Serial Wizard will move to the next dispense.

Icon buttons
These buttons are used to provide the major navigation from function to function within the user interface.

Keypad buttons
These buttons are used to add and clear numbers from the Value Indicator.

Keypad toggle
This toggles the keypad between letters and numbers.

Loop
This is used to loop steps in a method to *n* number of times.

Memory
The information storage capacity of an instrument.

Menu
A list of options or commands displayed on the display screen or a computer.

Method
A complete series of repeatable functions that can be performed by Microlab 600 instruments. These functions may consist of filling, dispensing, diluting, etc.

Method logging
This screen allows the user to list all method and step attributes that can be logged.

Method repeat
This tells the controller how many times to run a method. This value must be greater than 1 and should allow the user to run the method for an infinite number of times. The default setting will be infinite repeat.

Method trigger default
This allows users to choose a default value for the trigger column in the Basic Step Details. The options are Auto, Probe and TTL. The default setting is Probe. See Chapter 6 for more details.

Move
Favorites will automatically be saved in alphabetical order. If the user chooses to change this order they can select the method and then press the Move button to move the method to a different location.

Number of steps (Titration Wizard only)
This number is set based on the volume of the syringe used for the titration. If the syringe used is a 25 mL and the Step Volume is 250 µL, then the number of Steps is 10.

Numeric keypad
A group of keys on the controller display that are used to enter numeric data.

Parameter adjustment button
This button shows the current dispense setting. The exact function for this button is defined in greater detail in the Quick Start, Wizards and Custom Method sections of this manual.

Pipette
To measure a fixed amount of liquid with a probe and then dispense that same volume of liquid into a vessel.

Power down
To turn Off an electrical device.

Probe light
This option will allow the user to control when the indicator light on some hand probes will be On and Off. Valid selections for Wizards are to turn the light On or Off when the pump is busy or waiting for a trigger.

Program mode (Dilution Wizard only)
These are the four parameters that can be used to program a Dilution Wizard. These parameters are sample volume, diluent volume, factor and total volume.

Range indicator
For most parameters only specific values are acceptable. The Range Indicator displays the valid values for the parameter that is currently selected. If a value is entered outside of that range the font color will turn red until an allowed value is entered.

Rename

The user has the ability to change the name of a method or folder by selecting the method or folder and selecting the rename option. An alphanumeric keypad will appear and the name can be changed.

Reset (Dilution Wizard only)

This button allows the user to reset all values in the Dilution Wizard back to zero.

Restart

Once the endpoint is reached the instrument can be set for the next titration by pressing the restart button to start the Wizard over.

Run once

This may be set to either Yes or No. A setting of Yes means that the step will only be executed the first time through the method. The next time through this step will be skipped.

Run screen

This screen enables control and monitoring of all aspects of the pump's activities. Buttons and icons are used to change parameters and indicators are designed to give current and future status of the pump.

Run/Pause icon

When the Run button is pressed the pump will begin to perform the programmed action. The Run button will convert to a Pause button until the action is completed and then will turn back into a Run button. If the Pause button is pressed in the middle of an action, the pump will stop after the current action is completed. To stop the pump immediately press the Back button on the bottom left of the screen. The Pause function is only available in the Custom Method Run Screen.

Serial dispense

To distribute fluid in varying increments into a vessel.

Shift button

This button toggles the case of the letters from lowercase to uppercase.

Small icon buttons

These buttons provide additional functionality to change values on the current icon screen.

Speed

The rate the drive unit drives the syringe plunger in a low rate of µL/sec.

Step auto-repeat delay (Titration Wizard only)

The process of titration requires the repetitive dispensing of small volumes. As the user approaches the endpoint of a titration there is a need to dispense the Step volume one at a time, with each press of the trigger. When the user is further away from the endpoint holding the trigger for a time dictated by the Step Auto-Repeat Delay will result in repetitive dispensing of the step volume until the button is released.

Syringe delay

For some applications it is required to start moving one syringe while the other syringe is still moving. Since the pump ignores all new commands until the previous command is completed it is necessary to use the Syringe Delay for this purpose. Optional values are between 1 and 3,600 seconds. The default is to have no delay so both syringes start moving at the same time.

Syringe direction indicator

This indicator shows which direction the syringe will move in the next step. No arrow indicates the syringe will not be moving in the next step.

Syringe position indicator

This indicator shows the current syringe position graphically and in a numeric volume.

Syringe selection (Dual Syringe Dispenser with Pipette Wizard only)

For the Dual Syringe Dispenser it is possible to use the left or right syringe in an application. The user must decide which syringe to use when entering the Wizard.

Syringe speed

This will be set to the default speed of the syringe attached to the instrument. If the speed is to be changed only valid speed values will be allowed. If a speed chosen is faster than the default there is a risk of having a syringe stall in an application.

Titrate

To determine the smallest quantity of a substance needed for a certain reaction.
On the Microlab 600, all titration methods are interactive.

Trigger side

This will allow the user to select which side of the instrument the pump may be triggered in a given step. The options are Left, Right or Either. The pump default will be Either.

Toggle buttons

Use these buttons to move the highlighted row up and down. As the highlighted row is selected the value of the change buttons will also change to match the value of that row.

TTL control

This option will allow the user to turn On and Off a 5 volt signal to each of the four TTL output pins on the back of the Microlab 600. See Chapter 6 for more details.

Value indicator

This indicator displays the current value that will be stored when the Save/Enter button is pressed.

Valve move indicator

This indicator shows the current valve position and the position where the valve will move in the next step. If the indicator says “Ready” the valve will not move in the next step. For more details on the valve positions, see Section 3.3.1 in the Basic Manual (p/n 61440-01).

Valve position indicator

This indicator shows the current position of the valve and fluid path. For more details on the valve positions, see Section 3.3.1 in the Basic Manual (p/n 61440-01).

Valve rotation

This allows the user to set the rotation to Shortest route, clockwise (CW) or counterclockwise (CCW). The default will be the Shortest route.

Wash mode (Dilution and Pipette Wizards only)

This function provides the option to push a wash volume through the system to clean out the tubing after a dispense.

Wash volume

This is the amount of liquid that is pumped through the system and into a waste container after an application. The goal is to eliminate sample cross contamination. This step should always be triggered.

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